Figure 1. Strip Tillage. Source: https://farmtario.com/news/omafra-strip-till-demo-to-highlight-working-units/

Figure 2. No-till Corn Production. Source: http://www.omafra.gov.on.ca/english/landuse/soil-strategy.pdf

Conservation Tillage

Conservation tillage is any reduced tillage practice that leaves more than 30% of crop residues on the soil surface. This type of tillage reduces harmful disturbance to the soil, leading to a healthier, more diverse soil ecosystem.

Benefits of Conservation Tillage

- Increased amount of soil organic matter and biodiversity
- Increased ability for the soil to hold and conserve water
- Improved soil structure and water infiltration
- Improved air and water quality (due to decreased levels of soil erosion)
- Reduced production costs – due to reduced labour costs and fuel usage (from fewer tillage passes)
- Lower greenhouse gas emissions (from increased soil organic matter and less fuel usage)

*Keep in mind, to achieve the greatest benefit from reduced tillage systems, use crop rotations that increase biodiversity, and try to keep living roots in the ground for as much of the year as possible.

Types of Conservation Tillage

Strip Tillage	Soil is tilled in narrow strips where the subsequent seed will be placed, while the soil between the rows is left undisturbed. Fertilizer can also be applied in the seed row during tillage operations to reduce field passes. (See Figure 1)
Ridge Tillage	Same concept as strip tillage except strips are raised 3 to 6 inches above the ground in ridges.
No-Till (Zero Tillage)	Very low soil disturbance; no-till drills and planters are equipped to seed directly into the soil without any prior tillage. (See Figure 2)
Mulch Tillage	Includes any other reduced or minimum tillage system that retains 30% or more soil cover. Chisel plows, discs, field cultivators, and rotary tillers are common implements that are used in mulch tillage systems.

Figure 3. Example of a no-till seeding drill. Source: https://www.no-tillfarmer.com/articles/9142-no-till-innovations-from-the-2019-summer-farm-shows

Cost and soil impact comparison of common tillage practices		
Tillage practice	Relative cost (1= lowest to 10=highest)	Relative soil impact (1= lowest to 10=highest)
Moldboard plow	9	10
Disk-rip	8	7
Zone till	5	9
Chisel plow	7	8
Strip till	6	3
Ridge till	7	4
Disk-harrow	6	8
Vertical till	4	5
Field cultivation	3	6
Tandem disk	4	6
No-till	2	1

Source: https://extension.umn.edu/soil-management-and-health/tillage-implements-purpose-and-ideal-use#cost-and-soil-structure-1228710

Steer Clear of Conventional Tillage

In Ontario's agricultural sector, soil erosion, reduced water quality, and loss of biodiversity are all concerns, especially in systems that use conventional tillage. Conventional tillage is a practice that relies on processes such as deep tillage, plowing and certain types of discing to bury crop residues. These high-disturbance tillage practices impact our land by increasing wind and water erosion, creating losses of soil organic matter, biodiversity, soil moisture and soil structure, while increasing labour and fuel costs.

Things to Consider When Choosing a Tillage System

Slope of the Land

Land with slopes greater than 3% are more prone to erosion, so minimizing (or eliminating) tillage depth, intensity, and frequency is key in slopy areas. If tillage is necessary, contour farming (the practice of planting and tilling across a slope) and/or strip cropping should be considered. (See Figure 4)
(More info at: https://bmpbooks.com/media/Contour-Farming-and-Strip-Cropping.pdf)

Figure 4. Contour Strip Cropping
Source: http://www.omafra.gov.on.ca/english/environment/bmp/AF191.pdf

Implement Usage

The type of tillage implement used, along with the depth, speed, and frequency of tillage operations will determine the impact on the soil. For example, tilling deep into the soil with a plow is more harmful to the health of the soil than using vertical tillage, which is shallower and leaves more residue on the soil.

Tillage Timing

If tillage is necessary, consider the timing of your tillage operations. Spring tillage often increases the likelihood of compaction and soil structural damage due to wet field conditions, especially on clayey soils. Fall tillage reduces soil cover and leaves the soil exposed and susceptible to wind and water erosion over the winter months. Planting a cover crop in the fall can address both spring and fall tillage issues by increasing water movement through the soil (to dry up the soil) as well as the timeliness of seeding operations in the spring, while reducing or eliminating soil erosion over the winter.

Soil Type

Soils high in clay may require more tillage than other soil types. However, many farmers have found long-term benefits of using strip-till or no-till on clayey soils. (Ex. Eric Kaiser: https://www.topcropmanager.com/no-till-on-heavy-clay-soils-at-kaiser-lake-farms-6038/)

Be Patient

When switching from conventional tillage to conservation tillage, keep in mind that a transitional period is often necessary to build the soil and minimize short-term yield impacts. This is especially true when converting from conventional tillage to no-till.

Whether you are row cropping or vegetable and market gardening, reducing tillage can improve the health of your soil. However, what works for one farm or one piece of land may not work for another, so it is important to keep the above considerations in mind when planning your tillage practices.

Resources:
Fred Magdoff, Harold van Es. 2021. Minimizing Tillage. https://www.sare.org/publications/building-soils-for-better-crops/minimizing-tillage/

Jodi DeJong-Hughes and Aaron Daigh. 2021. Tillage Implements. https://extension.umn.edu/soil-management-and-health/tillage-implements-purpose-and-ideal-use#erosion-and-loss-of-organic-matter-1228712

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